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PRE-APPEAL BRIEF REQUEST FOR REVIEW

Docket Number (Optional): RD501

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on 07/23/2007

Signature Jill C. Stone

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Application Number	Filed
10/621,197	07/16/2003

First Named Inventor: HARTLEY OWEN

Art Unit	Examiner
1764	JOHN C. DOUGLAS

Applicant requests review of the final rejection in the above-identified application. No amendments are being filed with this request.

This request is being filed with a notice of appeal.

The review is requested for the reason(s) stated on the attached sheet(s).
Note: No more than five (5) pages may be provided.

I am the

- [ ] applicant/inventor.
- [ ] assignee of record of the entire interest. See 37 CFR 3.71. Statement under 37 CFR 3.73(b) is enclosed. (Form PTO/SB/96)
- [x] attorney or agent of record. Registration number 27598
- [ ] attorney or agent acting under 37 CFR 1.34. Registration number if acting under 37 CFR 1.34 ______

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Date: 07/23/2007

NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below*.

- [ ] *Total of 1 forms are submitted.

Appl. No.	10/621,197
Applicant	Hartley Owen
Filed	July 16, 2003
TC/A.U.	1764
Examiner	John Christopher Douglas
Docket No.	RDS01

Commissioner for Patents
P.O. Box 1450
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PRE-APPEAL BRIEF REQUEST FOR REVIEW

The history of FCC is briefly reviewed, then the invention and the points in the rejection will be dealt with more specifically.

HISTORY OF FCC

Fluidized Catalytic Cracking (FCC) makes, directly or indirectly, most of the gasoline in the US. The process is mature – in 1990 Inventor Owen co-authored FLUID CATALYTIC CRACKING REPORT, with a sub-heading, "50 years of catalytic cracking.", referring to the startup of the first commercial unit – a fixed bed – in 1936. If the same paper were presented today, it could be headed "70 years of catalytic cracking".

In FCC, there is a struggle to enhance catalytic cracking with higher and higher temperatures while suppressing thermal cracking. Refiners use ever more active catalysts and higher temperatures to crack ever heavier feeds. The high temperatures cause thermal cracking.

Thermal cracking – the goal of the ancient Dubbs visbreaking process – is a problem because thermal cracking is not as selective as catalytic cracking and because thermal cracking makes dienes that cause problems in downstream uses. Some developments are reviewed below.

In 1956, all riser cracking was discovered. Instead of cracking feed in a dense bed, it was cracked in a riser. Somewhat higher temperatures and a short residence time in the riser favored catalytic cracking. In the 1960s, zeolite cracking catalysts with far more activity than the amorphous catalysts were discovered. Higher temperatures were used to take full advantage of the new catalyst.

As temperatures increased in the riser, thermal cracking increased a trivial amount in the short residence time riser and increased a significant amount in the large volume reactor vessels and in and above the stripper. Thermal cracking degraded the desired cracked products.

In 1990, Inventor Owen filed on using riser cyclones to rapidly separate cracked products from spent catalyst exiting the riser – see his US 5,055,177, which was incorporated by reference. This approach got the bulk of cracked products safely away from the degrading experience of sitting a long time in the reactor void volume and in the FCC stripper. Some of the product exiting the riser did not, however, make the cut. Spent catalyst and cracked products fluidizing the catalyst were carried Charon - like across the Styx into a thermal cracking zone, the stripper and volume above the stripper, to be decimated into dienes and coke.

Refiners knew thermal cracking was a problem. Thermal cracking in the stripper and reactor volume was the subject of much study. The patent application reviews these in depth, but they are mentioned here - dome steam, quenching the riser, and post-riser quenching. Dome steam is the practice of adding a little bit of steam so that coke will not form in stagnant regions of the reactor vessel. Quench cools everything in, at the exit of, or just after the riser. Catalytic cracking is essentially done and catalyst activity has declined. Quenching cools cracked products and reduces thermal cracking.

These steps, riser cyclones, quench, etc. let more than 90% of the cracked product be recovered with minimal thermal cracking. Unfortunately, small amounts of cracked product pass through the stripper and the space above the stripper, regions which are hot. The relatively long residence time degrades some product before it can be removed.

STRIPPER CAP

As discussed at exhaustive length in this application specification, Page 6, line 12 through Page 10, Line 13, a capped stripper with lots of holes was proposed as a way to solve the

problem. Ross et al, (US 4,946,656) proposed isolating the stripper by capping it, but leaving large holes in the cap, and an annular opening around it, to let catalyst and standpipes down and vapors up. The vapor recovered in the stripper enjoys a quick trip out of the stripper via a dedicated pipe 30, connected to a cyclone inlet.

The '656 approach would reduce thermal cracking but, as discussed in the specification, and declaration, this "solution" has problems. The '656 approach leaves some cracked product out in the "cold", or more strictly speaking hot, stagnant region above the stripper cap where it could have a long residence time as there is relatively little vapor flow there. It is hard to fabricate such a stripper cap. It has to be broken down in pieces and field fabricated, and it has to be strong to survive years in the harsh sandblasting environment that is encountered in a modern FCC unit.

"Dome coke" may grow in the stagnant region where the cap meets the riser. While dome steam could be added, this is a hard place to reach and a fragile steam line could erode away and not survive years in the unit. The large holes in the dome must be large to accommodate thermal expansion, but then there is less isolation of the stripper by the cap. It can be difficult to support a side arm vapor removal line 30, as shown in the drawing, since it can get bent out of shape. This means even larger holes have to be left in the cap to accommodate this arm flexing.

In short, the '656 approach leaves much to be desired as a "solution" to the problem of thermal cracking above the stripper – the formidable cap is a lot of cap to field install and the holes let a lot of product into the void.

THE INVENTION

The invention is defined by claim 1 which is roughly 1 1/3 pages long and focuses on a riser reactor, closed cyclones, and a stripper in open fluid communication with the reactor vessel receiving spent catalyst from the cyclones. Spent catalyst is stripped in the stripper, stripped catalyst regenerated and recycled to the riser, and a snorkel sucks stripper vapors from above the stripper, conveying them to the cyclone separators.

THE REJECTION

Claims 1-3, 7 and 9 were rejected as obvious over Ross '656. (Claim 8 was rejected over Ross in view of Lomas US 5,584,985, but it can stand or fall with claim 1 – it will not be argued independently.)

The examiner's detailed and helpful analysis of Ross is not repeated here due to its length. The rejection could be abstracted as follows - Ross has everything in claim 1, but his stripper is capped and not in open fluid communication. There is nothing patentable in leaving something out, it would have been obvious to exclude the cap since the cap is not required.

ARGUMENT

Stonehenge used post and lintel construction. The Romans are generally credited with use of the arch for monumental construction projects. The arch, one of the great inventions in history, could be characterized as a post and lintel construction, with parts not needed left out, but it took centuries to go from post and lintel construction to the arch. It was not obvious.

Owen's use of a snorkel and fluid dynamics to isolate the stripper is an elegant solution to the problem of reducing cracking of stripper vapors.

Owen's stripper can be added easily to old and new FCC units. It does not create stagnant regions (like the dead region where Ross's cap meets the riser).

It is respectfully suggested that Ross, et al. teach that a stripper cap is essential. Ross's solution is inherently creaky, leaky, cokes easily, and is hard to install. It is creaky because the side arm vapor withdrawal line will torque. It is leaky because the large holes and annular space in the cap have to be large to accommodate differential thermal expansion as the unit starts up and shuts down. It cokes up easily because the stagnant regions can form coke.

Owen's declaration filed in response to the office action dated 8/23/2006 discusses the problems associated with the Ross stripper and notes that it has never been used, so far as is known.

In contrast, the claimed snorkel approach gets stripper vapors out before they can thermally crack and degrade. The snorkel approach can be done at a relatively low cost without the cost or potential problems of Ross's containment vessel.

SUMMARY

The problem of thermal cracking in catalytic cracking units has existed for well over half a century. Owen's 1990 development of riser cyclones got most of the product out rapidly, eliminating thermal cracking of rapidly removed product. The present invention teaches how to reduce thermal cracking for the small amount of product "left behind" to degrade in the stripper. No art teaches how to solve the problem of thermal cracking in and above the stripper in a way which can be used in commercial units.

Reconsideration and allowance are respectfully requested. If the examiner has questions about the technology or concerns about claim language, a telephone interview is invited.

Respectfully submitted

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